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Kiyotaki

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(54) **INFORMATION-PROCESSING DEVICE, INFORMATION-PROCESSING METHOD AND PROGRAM**

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G06F 3/14 (2006.01)

(52) **U.S. Cl.**
CPC ***G06F 3/1407*** (2013.01); *G09G 2340/0407* (2013.01); *G09G 2340/045* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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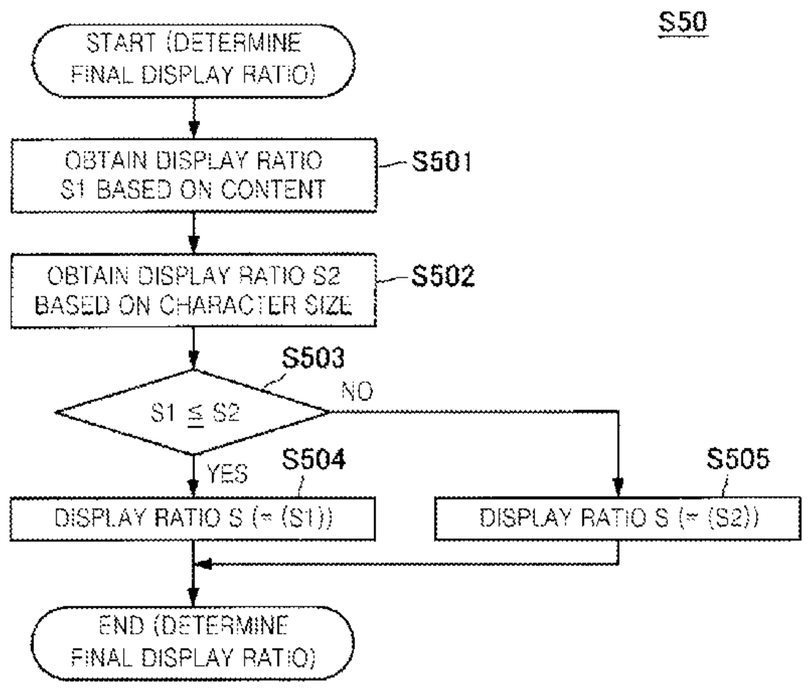
(57) **ABSTRACT**

An information processing apparatus and method are provided, the information processing apparatus including: a display unit that displays content in a display area; a content analyzing unit that obtains a content resolution indicating a resolution of the content by analyzing the content; a display resolution storage unit that stores a display resolution indicating a resolution of the display area; a display resolution storage unit that stores the display resolution from the display resolution storage unit; a display ratio calculating unit that calculates a display ratio of the content based on the content resolution obtained by the content analyzing unit and the display resolution obtained by the display resolution obtaining unit; and a display content generating unit that generates display content by adjusting a size of the content according to the display ratio calculated by the display ratio calculating unit.

5 Claims, 8 Drawing Sheets



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International Search Report (PCT/ISA/210) dated Aug. 1, 2011, issued in International Application No. PCT/KR2010/007559.

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FIG. 1

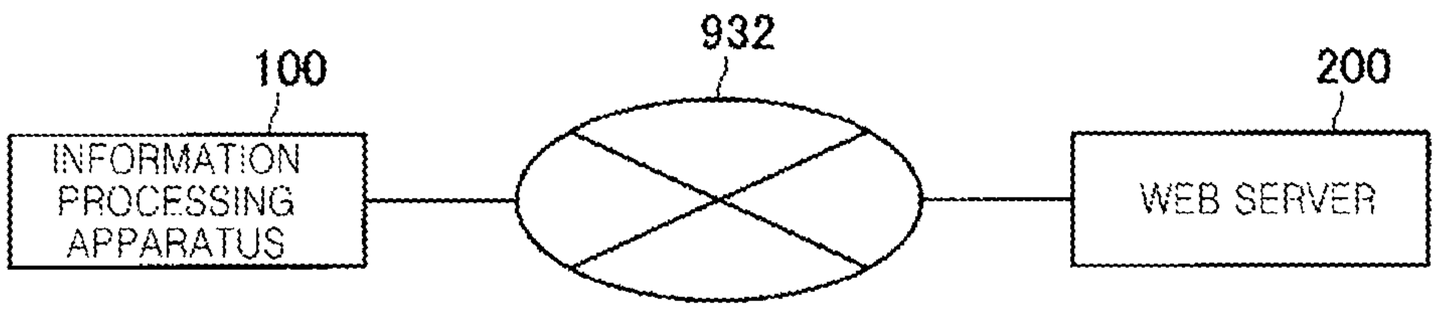


FIG. 2

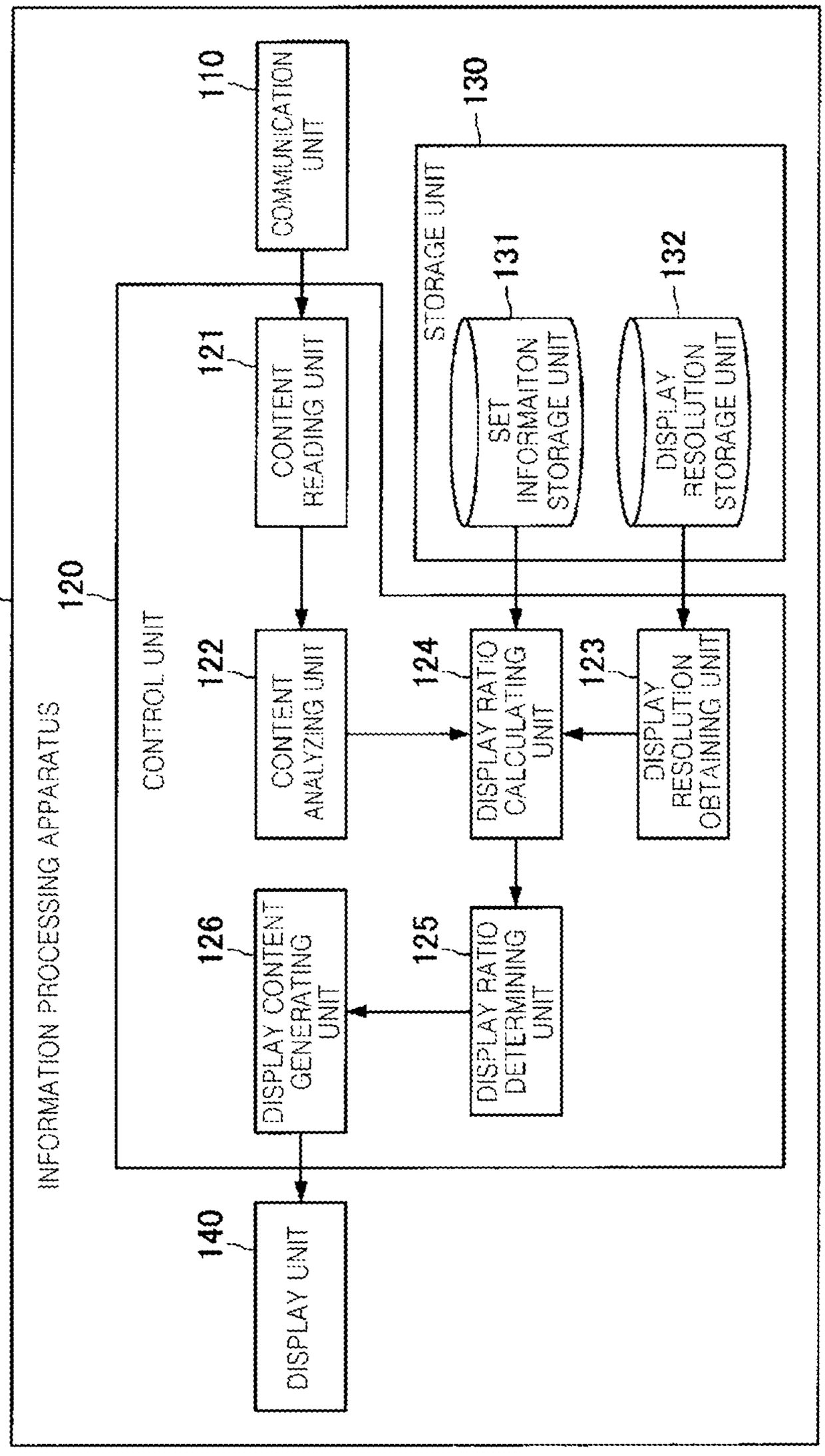

100
INFORMATION PROCESSING APPARATUS
110
COMMUNICATION UNIT
120
CONTROL UNIT
121
CONTENT READING UNIT
122
CONTENT ANALYZING UNIT
123
DISPLAY RESOLUTION OBTAINING UNIT
124
DISPLAY RATIO CALCULATING UNIT
125
DISPLAY RATIO DETERMINING UNIT
126
DISPLAY CONTENT GENERATING UNIT
130
STORAGE UNIT
131
SET INFORMAITON STORAGE UNIT
132
DISPLAY RESOLUTION STORAGE UNIT
140
DISPLAY UNIT

FIG. 3

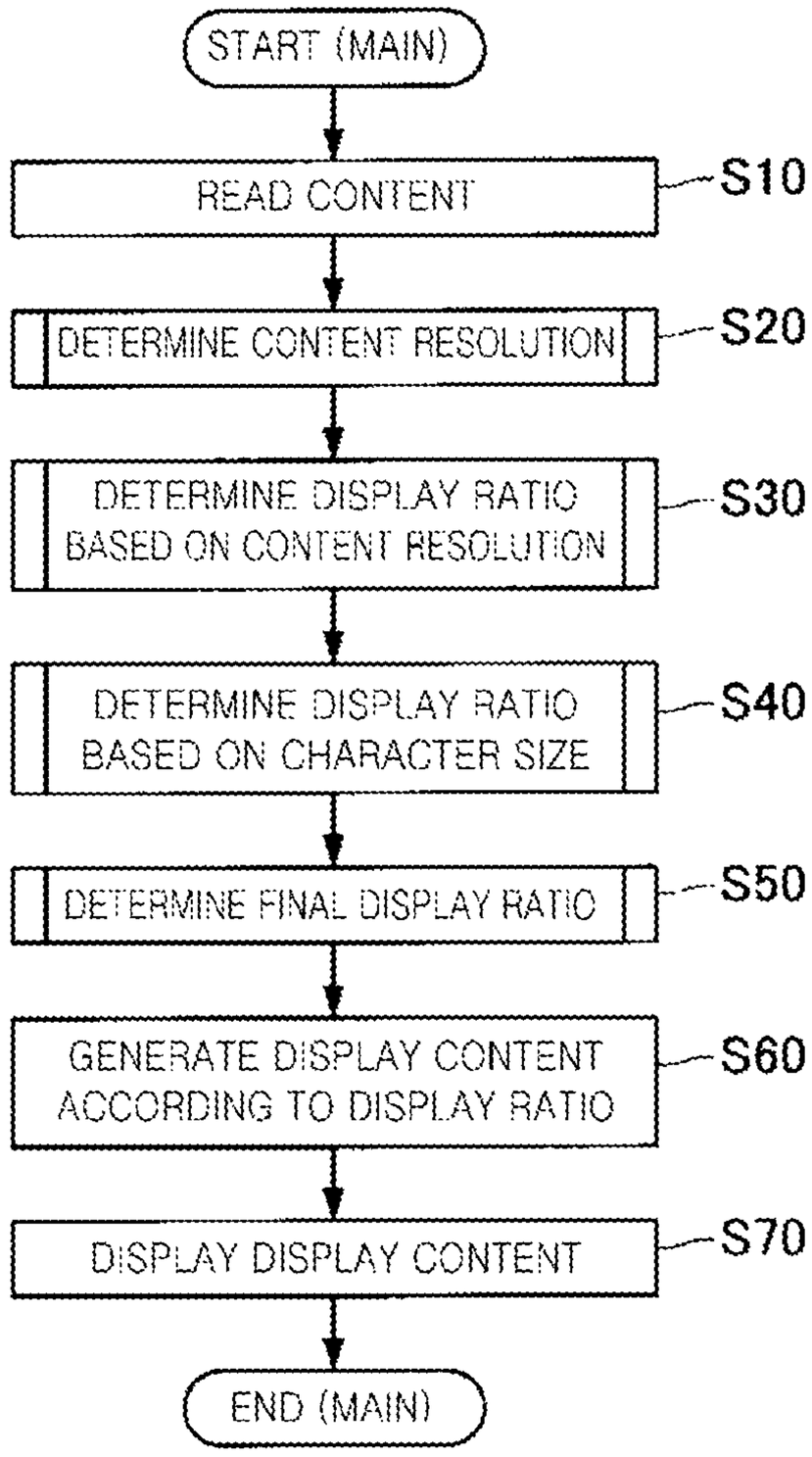

START (MAIN)
READ CONTENT
S10
DETERMINE CONTENT RESOLUTION
S20
DETERMINE DISPLAY RATIO BASED ON CONTENT RESOLUTION
S30
DETERMINE DISPLAY RATIO BASED ON CHARACTER SIZE
S40
DETERMINE FINAL DISPLAY RATIO
S50
GENERATE DISPLAY CONTENT ACCORDING TO DISPLAY RATIO
S60
DISPLAY DISPLAY CONTENT
S70
END (MAIN)

FIG. 4

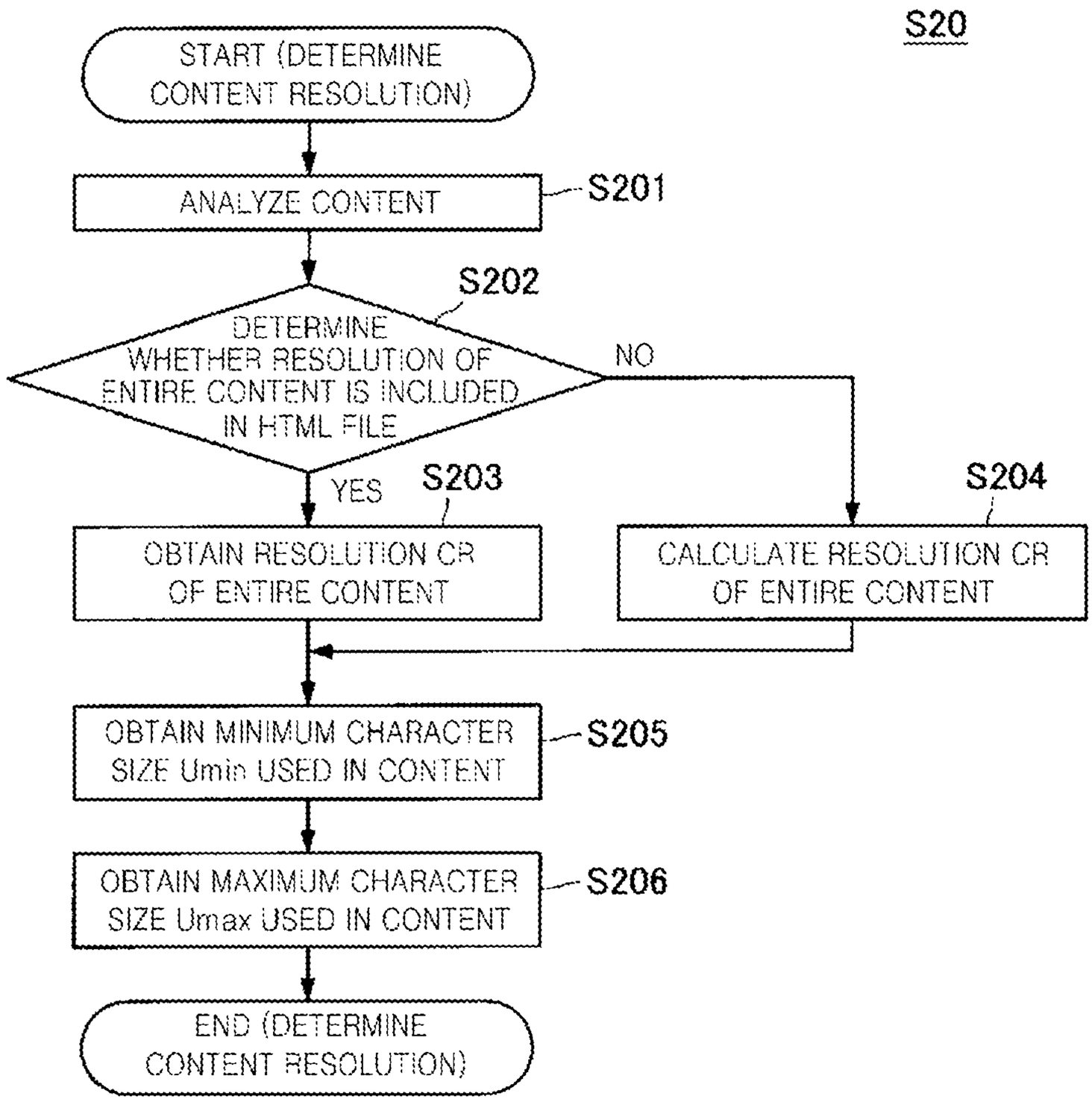

S20
START (DETERMINE CONTENT RESOLUTION)
ANALYZE CONTENT
S201
S202
DETERMINE WHETHER RESOLUTION OF ENTIRE CONTENT IS INCLUDED IN HTML FILE
NO
YES
S203
S204
OBTAIN RESOLUTION CR OF ENTIRE CONTENT
CALCULATE RESOLUTION CR OF ENTIRE CONTENT
OBTAIN MINIMUM CHARACTER SIZE Umin USED IN CONTENT
S205
OBTAIN MAXIMUM CHARACTER SIZE Umax USED IN CONTENT
S206
END (DETERMINE CONTENT RESOLUTION)

FIG. 5

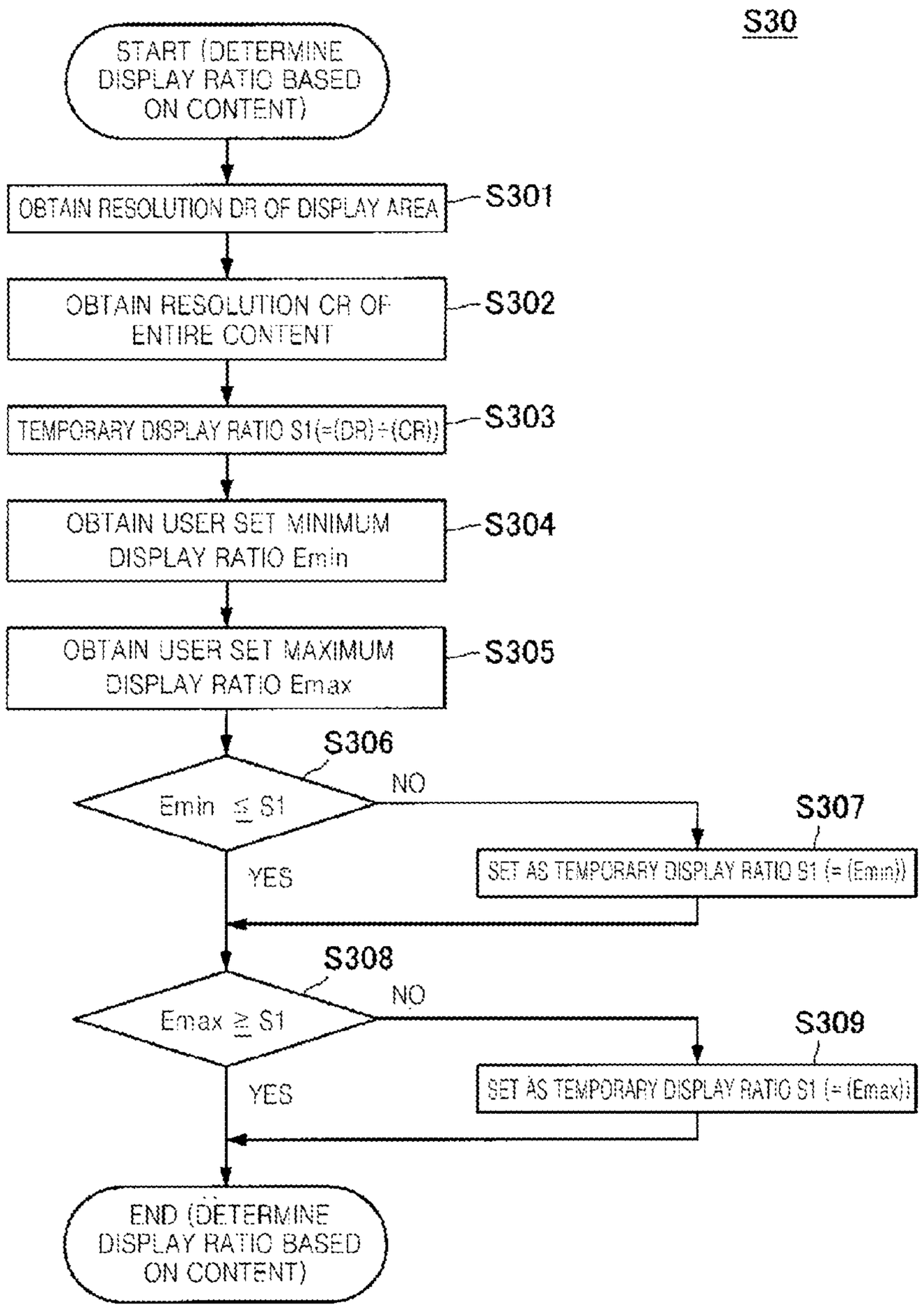

S30
START (DETERMINE DISPLAY RATIO BASED ON CONTENT)
OBTAIN RESOLUTION DR OF DISPLAY AREA
S301
OBTAIN RESOLUTION CR OF ENTIRE CONTENT
S302
TEMPORARY DISPLAY RATIO S1(=(DR)÷(CR))
S303
OBTAIN USER SET MINIMUM DISPLAY RATIO Emin
S304
OBTAIN USER SET MAXIMUM DISPLAY RATIO Emax
S305
S306
Emin ≦ S1
NO
S307
SET AS TEMPORARY DISPLAY RATIO S1 (= (Emin))
YES
S308
Emax ≧ S1
NO
S309
SET AS TEMPORARY DISPLAY RATIO S1 (= (Emax))
YES
END (DETERMINE DISPLAY RATIO BASED ON CONTENT)

FIG. 6

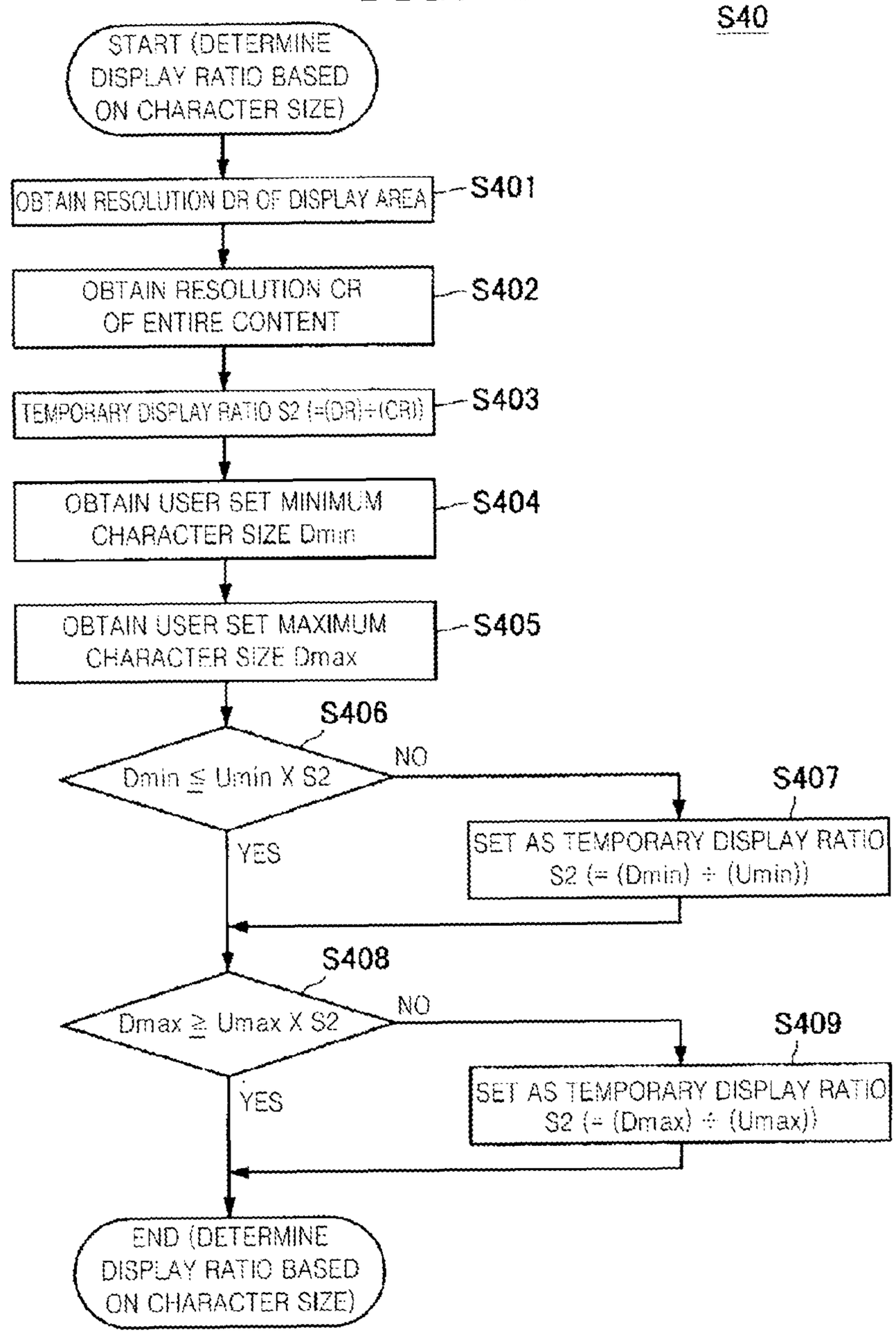
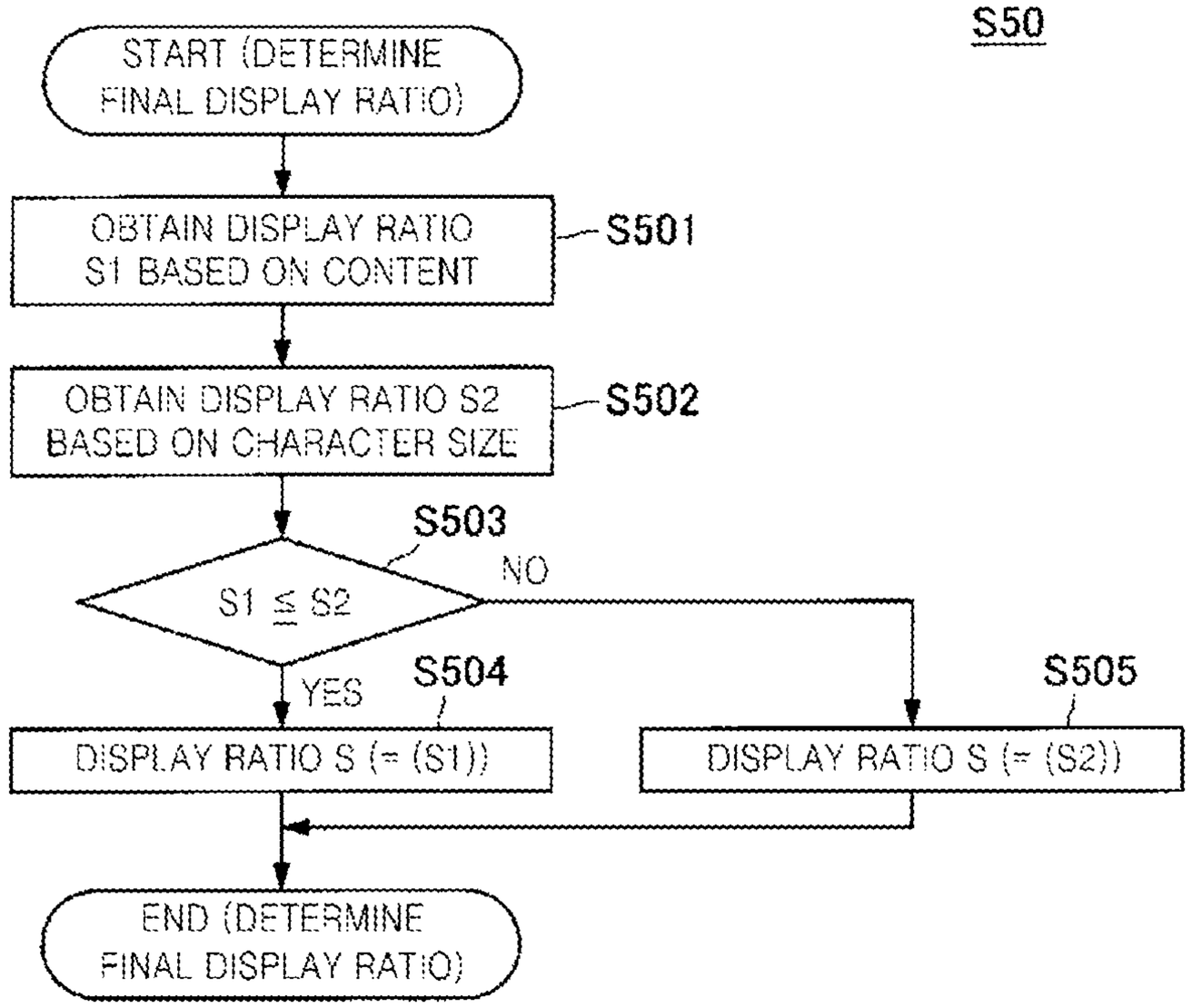

S40
START (DETERMINE DISPLAY RATIO BASED ON CHARACTER SIZE)
OBTAIN RESOLUTION DR OF DISPLAY AREA
S401
OBTAIN RESOLUTION CR OF ENTIRE CONTENT
S402
TEMPORARY DISPLAY RATIO S2 (=(DR)÷(CR))
S403
OBTAIN USER SET MINIMUM CHARACTER SIZE Dmin
S404
OBTAIN USER SET MAXIMUM CHARACTER SIZE Dmax
S405
S406
Dmin ≦ Umin X S2
NO
YES
S407
SET AS TEMPORARY DISPLAY RATIO S2 (= (Dmin) ÷ (Umin))
S408
Dmax ≧ Umax X S2
NO
YES
S409
SET AS TEMPORARY DISPLAY RATIO S2 (= (Dmax) ÷ (Umax))
END (DETERMINE DISPLAY RATIO BASED ON CHARACTER SIZE)

FIG. 7


S50
START (DETERMINE FINAL DISPLAY RATIO)
OBTAIN DISPLAY RATIO S1 BASED ON CONTENT
S501
OBTAIN DISPLAY RATIO S2 BASED ON CHARACTER SIZE
S502
S503
S1 ≤ S2
NO
YES
S504
DISPLAY RATIO S (= (S1))
S505
DISPLAY RATIO S (= (S2))
END (DETERMINE FINAL DISPLAY RATIO)

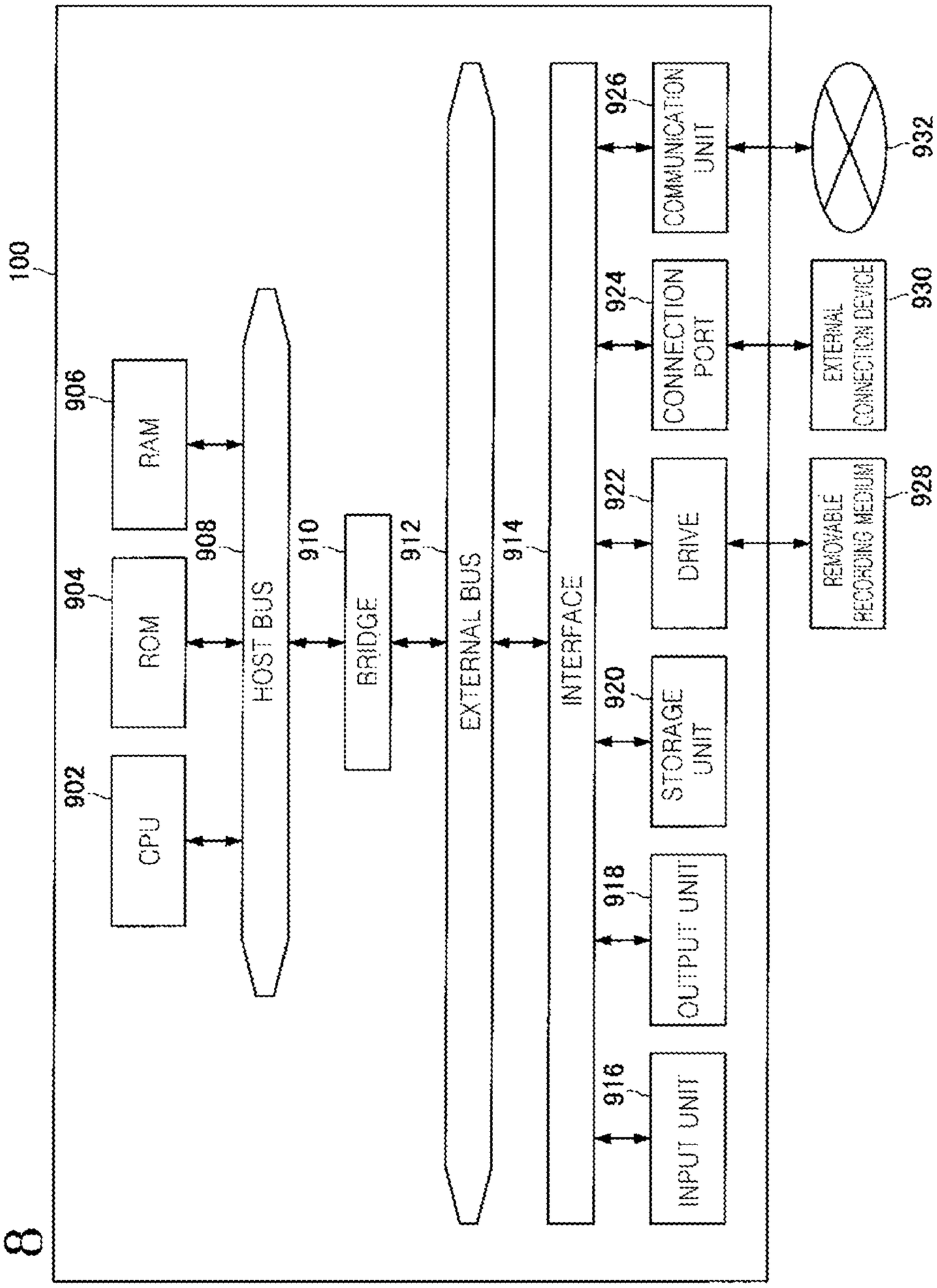

100
902
CPU
904
ROM
906
RAM
908
HOST BUS
910
BRIDGE
912
EXTERNAL BUS
914
INTERFACE
916
INPUT UNIT
918
OUTPUT UNIT
920
STORAGE UNIT
922
DRIVE
924
CONNECTION PORT
926
COMMUNICATION UNIT
928
REMOVABLE RECORDING MEDIUM
930
EXTERNAL CONNECTION DEVICE
932

FIG. 8

INFORMATION-PROCESSING DEVICE, INFORMATION-PROCESSING METHOD AND PROGRAM

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a National Stage of International Application No. PCT/KR2010/007559, filed Oct. 29, 2010, which claims priority from Japanese Patent Application No. 2009-248659, filed on Oct. 29, 2009, the contents of all of which are incorporated herein by reference in their entirety.

TECHNICAL FIELD

The exemplary embodiments relate to an information processing apparatus, an information processing method, and a program.

RELATED ART

Recently, the use of computers or televisions as display devices for displaying content such as still image content or moving image content is becoming more widespread. In general, a user who views content displayed on a display device, tends to focus on the part (image data or character data) of the content which is relatively large. However, since a display area has a limited space, if the part of the content is too large, the part of the content may extend beyond the display area.

Considering this problem, research has been conducted to increase or reduce a size of content, which is a target to be displayed, in accordance with a display area of a display device.

In a conventional technology, since a user has to increase or reduce a size of content whenever the size of the content needs to be adjusted, viewing content becomes inconvenient for the user. Also, in such a conventional technology, while a size of image data included in content may be increased or reduced, a size of the entire content including character data may not be increased or reduced.

Accordingly, there is provided an information processing apparatus, an information processing method, and a program which may increase or reduce a size of content in accordance with a resolution of a display area without inconveniencing the user.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram illustrating an information processing system according to an exemplary embodiment

FIG. **2** is a block diagram illustrating a of the information processing apparatus.

FIG. **3** is a flowchart illustrating a main process performed by the information processing apparatus.

FIG. **4** is a flowchart illustrating a process of determining a resolution of content performed by the information processing apparatus.

FIG. **5** is a flowchart illustrating a process of determining a display ratio by using a resolution of content performed by the information processing apparatus.

FIG. **6** is a flowchart illustrating a process of determining a display ratio by using a character size performed by the information processing apparatus;

FIG. **7** is a flowchart illustrating a process of determining a final display ratio performed by the information processing apparatus.

FIG. **8** is a block diagram illustrating hardware of a terminal device.

SUMMARY

According to an aspect of the present invention, there is provided an information processing apparatus including: a display unit that includes a display area and displays content in the display area; a content analyzing unit that obtains a content resolution indicating a resolution of the content by analyzing the content; a display resolution storage unit that stores a display resolution indicating a resolution of the display area; a display resolution obtaining unit that obtains the display resolution from the display resolution storage unit; a display ratio calculating unit that calculates a display ratio of the content based on the display resolution obtained by the display resolution obtaining unit and the content resolution obtained by the content analyzing unit; and a display content generating unit that generates display content by adjusting a size of the content according to the display ratio calculated by the display ratio calculating unit, wherein the display unit displays the display content generated by the display content generating unit in the display area. Accordingly, a size of content may be increased or reduced in accordance with a resolution of a display area without adding user inconvenience.

The display ratio calculating unit may calculate the display ratio by dividing the content resolution obtained by the content analyzing unit by the display resolution obtained by the display resolution obtaining unit.

The information processing apparatus may further include a set information storage unit that stores a maximum value of the display ratio as a set maximum display ratio, wherein the display ratio calculating unit, when the display ratio is greater than the set maximum display ratio stored in the set information storage unit, uses the set maximum display ratio as the display ratio. Accordingly, when a display ratio calculated based on a content resolution and a display resolution is greater than a set maximum display ratio, the set maximum display ratio may be used as a display ratio and display content may be prevented from being excessively increased.

The information processing apparatus may further include a set information storage unit that stores a maximum character size included in the content as a set maximum character size, wherein the content analyzing unit further obtains a content maximum character size that is a maximum character size included in the content by analyzing the content, wherein the display ratio calculating unit, when a character size obtained by multiplying the content maximum character size obtained by the content analyzing unit by the display ratio calculated by the display ratio calculating unit is greater than the set maximum character size stored in the set information storage unit, calculates the display ratio by dividing the set maximum character size by the display resolution. Accordingly, when a character size included in content is greater than a set maximum character size, a display ratio may be calculated by using the set maximum character size and a character size included in display content may be prevented from being excessively increased.

The information processing apparatus may further include a display ratio determining unit and a set information storage unit that stores a maximum character size included in the content as a set maximum character size and stores a maximum value of the display ratio as a set maximum display ratio, wherein the content analyzing unit further obtains a content maximum character size that is the maximum character size included in the content by analyzing the content,

wherein the display ratio determining unit includes: a first display ratio determining unit that when the display ratio is greater than the set maximum display ratio stored in the set information storage unit, determines the set maximum display ratio as a first display ratio, and when the display ratio is equal to or less than the set maximum display ratio stored in the set information storage unit, determines the display ratio calculated by the display ratio calculating unit as the first display ratio; a second display ratio determining unit that when a character size obtained by multiplying the content maximum character size obtained by the content analyzing unit by the display ratio calculated by the display ratio calculating unit is greater than the set maximum character size stored in the set information storage unit, determines a second display ratio by dividing the set maximum character size by the display resolution, and when the character size obtained by multiplying the content maximum character size obtained by the content analyzing unit by the display ratio calculated by the display ratio calculating unit is equal to or less than the set maximum character size stored in the set information storage unit, determines the display ratio calculated by the display ratio calculating unit as the second display ratio; and a display ratio selecting unit that selects a smaller one of the first display ratio and the second display ratio as the display ratio used by the display content generating unit. Accordingly, a display ratio when display content is relatively small may be used. Accordingly, a possibility that the display content is displayed beyond a display area may be reduced.

The information processing apparatus may further include a set information storage unit that stores a minimum value of the display ratio as a set minimum display ratio, wherein the display ratio calculating unit, when the display ratio is less than the set minimum display ratio stored in the set information storage unit, uses the set minimum display ratio as the display ratio. Accordingly, when a display ratio calculated based on a content resolution and a display resolution is less than a set minimum display ratio, the set minimum display ratio may be used as the display ratio and display content may be prevented from being excessively reduced.

The information processing apparatus may further include a set information storage unit that stores a minimum character size included in the content as a set minimum character size, wherein the content analyzing unit further obtains a content minimum character size that is the minimum character size included in the content by analyzing the content, wherein the display ratio calculating unit, when a character size obtained by multiplying the content minimum character size obtained by the content analyzing unit by the display ratio calculated by the display ratio calculating unit is less than the set minimum character size stored in the set information storage unit, calculates the display ratio by dividing the set minimum character size by the display resolution. Accordingly, even when a character size included in content is less than a set minimum character size, a display ratio may be calculated by using the set minimum character size and a character size included in display content may be prevented from being excessively reduced.

According to another aspect of the present invention, there is provided an information processing method performed by an information processing apparatus that includes a display unit that includes a display area and displays content in the display area, a display resolution storage unit that stores a display resolution indicating a resolution of the display area, a content analyzing unit, a display resolution obtaining unit, a display ratio calculating unit, and a display content generating unit, the information processing method including: obtaining a content resolution indicating a resolution of content by analyzing the content by using the content analyzing unit, and obtaining the display resolution from the display resolution storage unit by using the display resolution obtaining unit; calculating a display ratio of the content based on the content resolution obtained by the content analyzing unit and the display resolution obtained by the display resolution obtaining unit, by using the display ratio calculating unit; generating display content by adjusting a size of the content according to the display ratio calculated by the display ratio calculating unit, by using the display content generating unit; and displaying in the display area the display content generated by the display content generating unit, by using the display unit.

According to another aspect of the present invention, there is provided a program for allowing a computer to function as an information processing apparatus including: a display unit that includes a display area and displays content in the display area; a content analyzing unit that obtains a content resolution indicating a resolution of the content by analyzing the content; a display resolution storage unit that stores a display resolution indicating a resolution of the display area; a display resolution obtaining unit that obtains the display resolution from the display resolution storage unit; a display ratio calculating unit that calculates a display ratio of the content based on the content resolution obtained by the content analyzing unit and the display resolution obtained by the display resolution obtaining unit; and a display content generating unit that generates display content by adjusting a size of the content according to the display ratio calculated by the display ratio calculating unit, wherein the display unit displays in the display area the display content generated by the display content generating unit.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

The inventive concept will now be described more fully with reference to the accompanying drawings, in which exemplary embodiments of the inventive concept are illustrated. Also, in the drawings, elements having substantially the same functions are denoted by the same reference numerals and a repeated explanation thereof will not be given.

An aspect of an exemplary embodiment relates to a technology for automatically adjusting a size of content in accordance with a resolution of a display area. Also, the term content herein refers to any data such as still image data, moving image data, or text data as long as the data may be displayed on a display device.

An information processing system will be explained with reference to FIG. **1**. FIG. **1** is a block diagram illustrating an information processing system according to an aspect of an exemplary embodiment.

Referring to FIG. **1**, the information processing system mainly includes an information processing apparatus **100**, a web server **200**, and a network **932**. The term network refers to a network such as the Internet in which each device is specified with an Internet protocol (IP) address. The information processing apparatus **100** is not limited to one and a plurality of the information processing apparatuses **100** may be provided. Although content is obtained by the information processing apparatus **100** from the web server **200** via the network **932** in FIG. **1**, the information processing apparatus **100** may obtain content in other ways. For example, the information processing apparatus **100** may obtain content by reading the content from a recording medium. Also, the information processing apparatus **100** may read structured data for

defining a layout of the content in addition to the content. The structured data may be read from the recording medium.

The structured data is described in a markup language. Examples of the markup language may include a standard generalized markup language (SGML), a hypertext markup language (HTML) developed from the SGML, and TeX. The markup language is not limited thereto. The structured data is described in an HTML file in FIG. **1**.

The information processing apparatus **100** may be any apparatus as long as the apparatus may display content on a display device. Examples of the information processing apparatus **100** may include an information processing apparatus such as a personal computer, a portable information terminal such as a personal digital assistant (PDA), a digital television, a game player, a mobile phone, and various information home appliances.

The information processing apparatus **100** of the information processing system will be explained below.

An exemplary embodiment of the information processing apparatus **100** will be explained with reference to FIG. **2**. FIG. **2** is a block diagram illustrating the information processing apparatus **100**.

Referring to FIG. **2**, the information processing apparatus **100** may include a communication unit **110**, a control unit **120**, a storage unit **130**, and a display unit **140**. The control unit **120** mainly includes a content reading unit **121**, a content analyzing unit **122**, a display resolution obtaining unit **123**, a display ratio calculating unit **124**, a display ratio determining unit **125**, and a display content generating unit **126**. The storage unit **130** may include a set information storage unit **131** and a display resolution storage unit **132**.

The content reading unit **121** reads content from the web server **200** via the communication unit **110**. For example, when content identification information for identifying content is transmitted to the web server **200** via the network **932**, the content reading unit **121** receives the content identified by the content identification information from the web server **200** via the network **932**. The content identification information for identifying the content is input to the information processing apparatus **100** by, for example, a user. Also, if the information processing apparatus **100** already stores the content and thus the information processing apparatus **100** does not need to read the content from the web server **200**, the information processing apparatus **100** may not include the content reading unit **121**.

The content analyzing unit **122** obtains a content resolution indicating a resolution of content by analyzing the content. The content analyzed by the content analyzing unit **122** may be, for example, content read by the content reading unit **121** or content stored in a content storage unit (not shown). The content analyzing unit **122** may analyze content in various ways. For example, when a content resolution is included in an HTML file, the content analyzing unit **122** may obtain the content resolution from the HTML file.

For example, when a display layout of content is described in an HTML file, the content analyzing unit **122** obtains a content resolution by using width and height properties of style attributes of body elements described in the HTML file. The width properties indicate a resolution in a width direction of content and the height properties indicate a resolution in a height direction of the content. As such, the content analyzing unit **122** does not need to calculate a resolution of entire content. Also, for example, if a content resolution is not included in an HTML file, the content analyzing unit **122** may position content according to a display layout of the content described in the HTML file and then may calculate a resolution of the entire content.

Although the content resolution is the resolution of an entire content that is to be displayed, a resolution in a width direction of the entire content may be used or a resolution in a height direction of the entire content may be used. When a user viewing the content scrolls the content many times in a direction, even when the entire content is not included in a display area, a few problems may occur. For example, in the information processing apparatus **100** which allows a user to look at content by scrolling the content in a height direction, it may be more important to obtain content in a width direction than in a height direction of a display area. Therefore, it is more convenient for the user to use a resolution in the width direction as a content resolution.

The content analyzing unit **122** may further obtain a content maximum character size that is a maximum character size included in content by analyzing the content. The content maximum character size obtained by the content analyzing unit **122** is used to calculate a display ratio as will be described below. For example, a size described in an HTML file may be obtained as the content maximum size. If the content maximum size is not described in the HTML file, the content analyzing unit **122** may obtain the content maximum size by detecting a maximum size from among character sizes included in the content.

The content analyzing unit **122** may further obtain a content minimum character size that is a minimum character size included in content by analyzing the content. The content minimum character size obtained by the content analyzing unit **122** is used to calculate a display ratio as will be described below. A size described in an HTML file may be obtained as the content minimum size. If the content minimum size is not described in the HTML file, the content analyzing unit **122** may obtain the content maximum size by detecting a minimum size from among character sizes included in the content.

The display resolution storage unit **132** stores a display resolution indicating a resolution of a display area. The phrase "resolution of a display area" refers to a resolution of content with a maximum size in both a height direction and a width direction of a display area of the display unit **140**. A display resolution manipulated by a user may be displayed in the display area and may be confirmed by the user.

The display resolution obtaining unit **123** obtains a display resolution from the display resolution storage unit **132**. If a display resolution is manipulated by a user as described above, the display resolution obtaining unit **123** obtains a display resolution from the display resolution storage unit **132** and outputs the display resolution to the display unit **140**.

The display ratio calculating unit **124** calculates a display ratio of content based on a content resolution obtained by the content analyzing unit **122** and a display resolution obtained by the display resolution obtaining unit **123**. For example, the display ratio calculating unit **124** may calculate a display ratio (display resolution÷content resolution) by dividing the display resolution obtained by the display resolution obtaining unit **123** by the content resolution obtained by the content analyzing unit **122**.

The display ratio calculating unit **124** may calculate a display ratio by considering set information set by a user. For example, when a set maximum display ratio is set in the set information storage unit **131** as will be described below and a display ratio is greater than the set maximum display ratio stored in the set information storage unit **131**, the display ratio calculating unit **124** may use the set maximum display ratio as a display ratio. Accordingly, when a display ratio calculated based on a content resolution and a display resolution is greater than a set maximum display ratio, the set maximum

display ratio may be used as a display ratio and the resolution of the display content may be prevented from being excessively increased.

When a set minimum display ratio is set in the set information storage unit **131** as will be described below and a display ratio is less than the set minimum display ratio stored in the set information storage unit **131**, the display ratio calculating unit **124** may use the set minimum display ratio as a display ratio. Accordingly, when a display ratio that is a result of a calculation performed on a content resolution and a display resolution is less than a set minimum display ratio, the set minimum display ratio may be used as a display ratio and the resolution of the display content may be prevented from being excessively reduced.

A set maximum character size may be set in the set information storage unit **131**. In this case, when a character size (content maximum character size x display ratio) obtained by multiplying a content maximum character size obtained by the content analyzing unit **122** by a display ratio that is calculated is greater than the set maximum character size stored in the set information storage unit **131**, the display ratio calculating unit **124** may calculate a display ratio (set maximum character size÷display resolution) by dividing the set maximum character size by a display resolution. Accordingly, when a character size included in content is greater than a set maximum character size, a display ratio may be calculated by using a set maximum character size and a character size included in display content may be prevented from being excessively increased.

A set minimum character size may be set in the set information storage unit **131** as will be described below. In this case, when a character size (content minimum character size× display ratio) obtained by multiplying a content minimum character size obtained by the content analyzing unit **122** by a display ratio that is calculated is less than the set minimum character size stored in the set information storage unit **131**, the display ratio calculating unit **124** may calculate a display ratio (set minimum character size÷display resolution) by dividing the set minimum character size by a display resolution. Accordingly, when a character size included in content is less than a set minimum character size, a display ratio may be calculated by using a set minimum character size and a character size included in display content may be prevented from being excessively reduced.

The display ratio determining unit **125** functions when the set information storage unit **131** stores both a set maximum character size and a set maximum display ratio. In this case, the display ratio determining unit **125** includes, for example, a first display ratio determining unit (not shown), a second display ratio determining unit (not shown), and a display ratio selecting unit (not shown).

When a display ratio calculated by the display ratio determining unit **125** is greater than a set maximum display ratio stored in the set information storage unit **131**, the first display ratio determining unit determines the set maximum display ratio as a first display ratio. When a display ratio calculated by the display ratio determining unit **125** is equal to or less than a set maximum display ratio stored in the set information storage unit **131**, the first display ratio determining unit determines the display ratio calculated by the display ratio determining unit **125** as a first display ratio.

When a character size, obtained by multiplying a content maximum character size obtained by the content analyzing unit **122** by a display ratio that is calculated, is greater than a set maximum character size stored in the set information storage unit **131**, the second display ratio determining unit determines a second display ratio by dividing the set maximum character size by a display resolution. When a character size, obtained by multiplying a content maximum character size obtained by the content analyzing unit **122** by a display ratio that is calculated is equal to or less than a set maximum character size stored in the set information storage unit **131**, the second display ratio determining unit determines the display ratio that is calculated as a second display ratio.

The display ratio selecting unit selects a smaller one of the first display ratio and the second display ratio as a display ratio used by the display content generating unit **126**. The first display ratio is adjusted to be equal to the set maximum display ratio and the second display ratio is adjusted such that a maximum character size after being adjusted is equal to or less than the set maximum character size. Accordingly, once a smaller one of the first display ratio and the second display ratio is selected as a display ratio used by the display content generating unit **126**, a display ratio when display content is relatively small may be used. Accordingly, a possibility that display content is displayed beyond a display area may be reduced.

Alternatively, the display ratio selecting unit may select a larger one of the first display ratio and the second display ratio as a display ratio used by the display content generating unit **126**. In this case, a display ratio when display content is relatively large may be used. Accordingly, a possibility that a character having a small size and included in content that is displayed in a display area may be reduced.

When a display ratio calculated by the display ratio determining unit **125** is less than a set minimum display ratio stored in the set information storage unit **131**, the first display ratio determining unit may determine the set minimum display ratio as a first display ratio. When a display ratio calculated by the display ratio determining unit **125** is equal to or greater than a set minimum display ratio stored in the set information storage unit **131**, the first display ratio determining unit may determine the display ratio calculated by the display ratio determining unit **125** as a first display ratio.

When a character size obtained by multiplying a content minimum character size obtained by the content analyzing unit **122** by a display ratio that is calculated is less than a set minimum character size stored in the set information storage unit **131**, the second display ratio determining unit may determine a second display ratio by dividing the set minimum character size by a display resolution. When a character size obtained by multiplying a content minimum character size obtained by the content analyzing unit **122** by a display ratio that is calculated is equal to or greater than a set minimum character size stored in the set information storage unit **131**, the second display ratio determining unit may determine the display ratio that is calculated as a second display ratio.

The display content generating unit **126** generates display content by adjusting a size of content according to a display ratio calculated by the display ratio calculating unit **124**. When a display ratio calculated by the display ratio calculating unit **124** is, for example, 200%, the display content generating unit **126** generates display content by increasing the size of the content two times. When a display ratio calculated by the display ratio calculating unit **124** is, for example, 50%, the display content generating unit **126** generates display content by reducing the size of the content 0.5 times.

The display unit **140** having a display area may display content in the display area. Also, the display unit **140** displays in the display area display content generated by the display content generating unit **126**. The display unit **140** includes, for example, a display device as will be described below.

The set information storage unit **131** stores set information set by a user. There may be various types of set information.

When a maximum value of a display ratio is set by a user, the set information storage unit **131** may store the maximum value as a set maximum display ratio. Also, when a minimum value of a display ratio is set by a user, the set information storage unit **131** may store the minimum value as a set minimum display ratio. Also, the set information storage unit **131** may store a maximum character size included in content as a set maximum character size. Also, the set information storage unit **131** may store a minimum character size included in content as a set minimum character size.

An exemplary embodiment of the information processing apparatus **100** has been described. In this configuration, a size of content may be increased or reduced in accordance with a resolution of a display area without adding user inconvenience.

An information processing method performed by the information processing apparatus **100** will be explained below with reference to FIGS. **3** through **7**. FIGS. **3** through **7** are flowcharts illustrating an information processing method performed by the information processing apparatus **100**, according to an exemplary embodiment.

FIG. **3** is a flowchart illustrating a main process of the information processing method performed by the information processing apparatus **100**. The main process performed by the information processing apparatus **100** will be explained with reference to FIG. **3**.

Referring to FIG. **3**, in operation S**10**, the content reading unit **121** reads content from the web server **200** via the network **932**. Although the content reading unit **121** obtains content by reading the content from the web server **200** in FIG. **3**, the content reading unit **121** may obtain content by using other methods as described above. Also, the content reading unit **121** obtains structured data such as an HTML file in addition to the content from the web server **200**. The structured data such as the HTML file may be obtained by being read from the web server **200** or by using other methods.

In operation S**20**, the information processing apparatus **100** determines a content resolution. Operation S**20** will be explained below in detail with reference to FIG. **4**. Next, in operation S**30**, the information processing apparatus **100** determines a display ratio by using the content resolution. Operation S**30** will be explained below in detail with reference to FIG. **5**. Next, in operation S**40**, the information processing apparatus **100** determines a display ratio by using a character size. Operation S**40** will be explained below in detail with reference to FIG. **6**. Next, in operation S**50**, the information processing apparatus **100** determines a final display ratio. Operation S**50** will be explained below in detail with reference to FIG. **7**.

FIG. **4** is a flowchart illustrating operation S**20** in which a content resolution is determined as performed by the information processing apparatus **100**. Operation S**20** in which a content resolution is determined as performed by the information processing apparatus **100** will be explained with reference to FIG. **4**.

Referring to FIG. **4**, in operation S**201**, the content analyzing unit **122** of the information processing apparatus **100** analyzes content. Next, in operation S**202**, the content analyzing unit **122** determines whether a resolution of the entire content is included in an HTML file. When it is determined in operation S**202** that the resolution of the entire content is included in the HTML file, the method proceeds to operation S**203**. In operation S**203**, the resolution CR of the entire content is obtained and operation S**203** proceeds to operation S**205**. When it is determined in operation S**202** that the resolution of the entire content is not included in the HTML file, operation S**203** proceeds to operation S**204**. In operation S**204**, the resolution CR of the entire content is calculated, and operation S**20** proceeds to operation S**205**.

In operation S**205**, the content analyzing unit **122** obtains a minimum character size used in the content. In operation S**206**, a maximum character size used in the content is obtained, and operation S**20** ends.

FIG. **5** is a flowchart illustrating operation S**30** in which a display ratio is determined based on a content resolution as performed by the information processing apparatus **100**. Operation S**30** in which a display ratio is determined based on a content resolution as performed by the information processing apparatus **100** will be explained with reference to FIG. **5**.

Referring to FIG. **5**, in operation S**301**, the display resolution obtaining unit **123** of the information processing apparatus **100** obtains a resolution DR of a display area from the display resolution storage unit **132**. Next, in operation S**302**, the content analyzing unit **122** obtains a resolution CR of entire content. A resolution obtained in operation S**203** or operation S**204** may be used as the resolution CR of the entire content. In operation S**303**, the display ratio calculating unit **124** calculates a temporary display ratio S**1** as (S**1**)=(DR)÷(CR). The temporary display ratio S**1** corresponds to the first display ratio. Next, in operation S**304**, the display ratio calculating unit **124** obtains a user set minimum display ratio Emin from the set information storage unit **131**, and in operation S**305**, the display ratio calculating unit **124** obtains a user set maximum display ratio Emax from the set information storage unit **131**.

In operation S**306**, the display ratio calculating unit **124** determines whether the user set minimum display ratio Emin is equal to or less than the temporary display ratio S**1**. When it is determined in operation S**306** that the user set minimum display ratio Emin is greater than the temporary display ratio S**1**, operation S**306** proceeds to operation S**307**. In operation S**307**, the user set minimum display ratio Emin is set as the temporary display ratio S**1**, and operation S**307** proceeds to operation S**308**. When it is determined in operation S**306** that the user set minimum display ratio Emin is equal to or less than the temporary display ratio S**1**, operation S**306** proceeds to operation S**308**.

In operation S**308**, the display ratio calculating unit **124** determines whether the user set maximum display ratio Emax is equal to or greater than the temporary display ratio S**1**. When it is determined in operation S**308** that the user set maximum display ratio Emax is less than the temporary display ratio S**1**, the display ratio calculating unit **124** sets the user set maximum display ratio Emax as the temporary display ratio S**1** in operation S**309**, and operation S**30** ends. When it is determined in operation S**308** that the user set maximum display ratio Emax is greater than or equal to the temporary display ratio S**1**, operation S**30** ends.

FIG. **6** is a flowchart illustrating operation S**40** in which a display ratio is determined based on a character size as performed by the information processing apparatus **100**. Operation S**40** in which a display ratio is determined based on a character size as performed by the information processing apparatus **100** will be explained with reference to FIG. **6**.

Referring to FIG. **6**, in operation S**401**, the display resolution obtaining unit **123** of the information processing apparatus **100** obtains a resolution DR of a display area from the display resolution storage unit **132**. A display resolution obtained in operation S**401** may be used as the display resolution DR. Next, in operation S**402**, the content analyzing unit **122** obtains a resolution CR of entire content. A resolution obtained in operation S**203** or S**204** may be used as the resolution CR of the entire content. In operation S**403**, the display

ratio calculating unit **124** calculates a temporary display ratio S**2** as (S**2**)=(DR)÷(CR). The temporary display ratio S**2** corresponds to the second display ratio. Next, in operation S**404**, the display ratio calculating unit **124** obtains a user set minimum character size Dmin from the set information storage unit **131**. In operation S**405**, the display ratio calculating unit **124** obtains a user set maximum character size Dmax from the set information storage unit **131**.

In operation S**406**, the display ratio calculating unit **124** determines whether the user set minimum character size Dmin is equal to or less than a value obtained by multiplying a minimum character size included in content by the temporary display ratio S**2**. When it is determined in operation S**406** that the user set minimum character size Dmin is greater than the value obtained by multiplying the minimum character size Umin included in the content by the temporary display ratio S**2**, operation S**406** proceeds to operation S**407**. In operation S**407**, the display ratio calculating unit **124** sets a result ((Dmin)÷(Umin)) obtained by dividing the user set minimum character size Dmin by the minimum character size Umin included in the content as the temporary display ratio S**2**, and operation S**407** proceeds to operation S**408**. When it is determined in operation S**406** that the user set minimum character size Dmin is equal to or less than the value obtained by multiplying the minimum character size included in the content by the temporary display ratio S**2**, operation S**406** proceeds to operation S**408**.

In operation S**408**, the display ratio calculating unit **124** determines whether the user set maximum character size Dmax is equal to or greater than a value obtained by multiplying a maximum character size Umax included in the content by the temporary display ratio S**2**. When it is determined in operation S**408** that the user set maximum character size Dmax is less than the value obtained by multiplying the maximum character size Umax included in the content by the temporary display ratio S**2**, the display ratio calculating unit **124** sets a result ((Dmax)÷(Umax)) obtained by dividing the user set maximum character size Dmax by the maximum character size Umax included in the content as the temporary display ratio S**2** in operation S**409**, and operation S**40** ends. When it is determined in operation S**408** that the user set maximum character size Dmax is equal to or greater than the value obtained by multiplying the maximum character size Umax included in the content by the temporary display ratio S**2**, operation S**40** ends.

FIG. **7** is a flowchart illustrating operation S**50** in which a final display ratio is determined as performed by the information processing apparatus **100**. Operation S**50** in which a final display ratio is determined as performed by the information processing apparatus **100** will be explained with reference to FIG. **7**.

Referring to FIG. **7**, in operation S**501**, the display ratio determining unit **125** of the information processing apparatus **100** obtains a display ratio S**1** based on content. In operation S**502**, the display ratio determining unit **125** obtains a display ratio S**2** based on a character size. A display ratio obtained by operation S**30** of FIG. **5** may be used as the display ratio S**1** based on the content. A display ratio obtained by operation S**40** of FIG. **6** may be used as the display ratio S**2** based on the character size.

In operation S**503**, the display ratio determining unit **125** determines whether the display ratio S**1** based on the content is equal to or less than the display ratio S**2** based on the character size. When it is determined in operation S**503** that the display ratio S**1** based on the content is equal to or less than the display ratio S**2** based on the character size, operation S**50** proceeds to operation S**504**. In operation S**504**, the display ratio determining unit **125** sets the display ratio S**1** based on the content as a display ratio S and operation S**50** ends. When it is determined in operation S**503** that the display ratio S**1** based on the content is greater than the display ratio S**2** based on the character size, operation S**50** proceeds to operation S**505**. In operation S**505**, the display ratio determining unit **125** sets the display ratio S**2** as a display ratio S, and operation S**50** ends. The display ratio S is used to generate display content in operation S**60**.

According to operation S**50** of FIG. **7**, a size of content may be increased or reduced in accordance with a resolution of a display area without adding user inconvenience.

Functions of elements constituting the information processing apparatus **100** may be performed by using a computer program for executing the functions by using devices forming hardware in FIG. **8**. FIG. **8** is a block diagram illustrating hardware of the information processing apparatus **100** for performing functions of elements of the information processing apparatus **100**.

Referring to FIG. **8**, the information processing apparatus **100** includes a central processing unit (CPU) **902**, a read-only memory (ROM) **904**, a random access memory (**906**), a host bus **908**, a bridge **910**, an external bus **912**, an interface **914**, an input unit **916**, an output unit **918**, a storage unit **920**, a drive **922**, a connection port **924**, and a communication unit **926**.

The CPU **902** functions as a calculator or a controller and controls an overall or partial operation of each element of the information processing apparatus **100** based on various programs recorded on the ROM **904**, the RAM **906**, the storage unit **920**, or a removable recording medium **928**. The ROM **904** stores calculation data or programs read by the CPU **902**. The RAM **906** temporarily or permanently stores the programs read by the CPU **902** or various parameters which appropriately vary when the programs are executed. The CPU **902**, the ROM **904**, and the RAM **906** are connected to one another via the host bus **908** through which data may be transmitted at a high speed. Also, the host bus **908** is connected to the external bus **912** through which data may be transmitted at a low speed via the bridge **910**.

The input unit **916** is a manipulation unit such as a mouse, a keyboard, a touch panel, a button, a switch, or a lever. Alternatively, the input unit **916** may be a remote control unit that may transmit a control signal by using infrared rays or other electric waves. Also, the input unit **916** may include an input control circuit for transmitting information input by using the manipulation unit as an input signal to the CPU **902**.

The output unit **918** may visually or audibly provide to a user information obtained by a display device such as a cathode ray tube (CRT), a liquid crystal display (LCD), a plasma display panel (PDP), or an electro-luminescence display (ELD), an audio output device such as a speaker or a headphone, a printer, a mobile phone, or a facsimile machine.

The storage unit **920** for storing various data may include, for example, a magnetic storage device such as a hard disk drive (HDD), a semiconductor storage device, an optical storage device, or a magneto-optical storage device.

The drive **922** reads information recorded on the removable recording medium **928** such as a magnetic disk, an optical disk, a magneto-optical disk, or a semiconductor memory, or writes information to the removable recording medium **928**. Examples of the removable recording medium **928** may include a DVD medium, a Blu-ray medium, a high definition (HD)-DVD medium, a compact flash (CF) (trademark), a memory stick, and a secure digital (SD) memory card. Examples of the removable recording medium **928** may also

include an integrated circuit (IC) card including a contactless IC chip or an electronic device.

The connection port **924** is a port for connecting an external connection device **930** such as a universal serial bus (USB) port, an IEEE 1394 port, a small computer system interface (SCSI), an RS-232C port, or an optical audio terminal. Examples of the external connection device **930** may include a printer, a portable music player, a digital camera, a digital video camera, and an IC recorder.

Examples of the communication unit **926** for connecting to the network **932** may include a wired or wireless local area network (LAN), a Bluetooth (trademark), a communication card for wireless USB (WUSB), a router for optical communication, a router for asymmetric digital subscriber line (SL), and a modem for various communications. Examples of the network **932** connected to the communication unit **926** in a wired or wireless manner may include the Internet, a LAN in a household, an infrared communication network, a visible communication network, a broadcast communication network, and a satellite communication network.

While the inventive concept has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope of the inventive concept as defined by the following claims.

Accordingly, an information processing apparatus, an information processing method, and a program may increase or reduce a size of content in accordance with a resolution of a display area without inconveniencing the user.

What is claimed is:

1. An information processing method performed by an information processing apparatus, the information processing method comprising:

obtaining a display resolution indicating a resolution of a display;

analyzing content and obtaining a content resolution indicating a resolution of the content and obtaining a character size of the content;

calculating a first display ratio of the content based on the content resolution and the display resolution;

calculating a second display ratio of the content based on the character size and the display resolution;

setting a final display ratio as one of the first display ratio or the second display ratio;

adjusting a size of the content according to the final display ratio; and

generating the size adjusted content to be displayed.

2. The information processing method of claim **1**, wherein the analyzing the content and obtaining the content resolution indicating the resolution of the content and obtaining the character size of the content further comprises:

calculating the content resolution when resolution information of the content is not included in the content;

obtaining the content resolution when resolution information of the content is included in the content;

obtaining a minimum character size used in the content; and

obtaining a maximum character size used in the content.

3. The information processing method of claim **2**, wherein the calculating the first display ratio of the content based on the content resolution and the display resolution further comprises:

calculating a temporary display ratio by dividing the display resolution by the content resolution;

obtaining a user set minimum display ratio and a user set maximum display ratio;

setting the first display ratio to be the temporary display ratio when the temporary display ratio is greater than or equal to the user set minimum display ratio and less than or equal to the user set maximum display ratio;

setting the first display ratio to be the user set maximum display ratio when the temporary display ratio is greater than the user set maximum display ratio; and

setting the first display ratio to be the user set minimum display ratio when the temporary display ratio is less than the user set minimum display ratio.

4. The information processing method of claim **2**, wherein the calculating the second display ratio of the content based on the character size and the display resolution further comprises:

calculating a temporary display ratio by dividing the display resolution by the content resolution;

obtaining a user set minimum character size and a user set maximum character size;

setting the second display ratio to be the temporary display ratio when the user set minimum character size is less than or equal to the minimum character size used in the content multiplied by the temporary display ratio and the user set maximum character size is greater than or equal to the maximum character size used in the content multiplied by the temporary display ratio;

setting the second display ratio to be the user set minimum character size divided by the minimum character size used in the content when the user set minimum character size is greater than the minimum character size used in the content multiplied by the temporary display ratio; and

setting the second display ratio to be the user set maximum character size divided by the maximum character size used in the content when the user set maximum character size is less than the maximum character size used in the content multiplied by the temporary display ratio.

5. The information processing method of claim **1**, wherein the setting the final display ratio as one of the first display ratio or the second display ratio further comprises:

setting the first display ratio as the final display ratio when first display ratio is greater than the second display ratio; and

setting the second display ratio as the final display ratio when first display ratio is less than or equal to the second display ratio.

* * * * *